A workshop for
Pruning

Facilitator's Guide

FOREST
RENEWAL BC

BRITISH
COLUMBIA

Ministry of Forests
Forest Practices Branch

Acknowledgements

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Facilitator's Instructions

How to Use this Guide

You have been hired to communicate the information included in these materials. You must have the approval of the Ministry of Forests contact person before adding information or changing the intended message of this workshop.

The success of any workshop will depend on how well the facilitator selects activities to communicate the intended message to the participants. This guide is a complete package and should address the needs of most audiences. However, the care and thoroughness with which you plan and prepare for each workshop will make the difference between a mediocre and a successful event. Please review these materials carefully and have fun being part of the learning process.

This guide is designed to help you prepare for and deliver this workshop.

The Workshop Introduction contains general information on the background, objectives, target audience and format for the workshop. Please read this information to ensure that you understand why and how this workshop was developed.

Lesson plans at the beginning of each lesson provide learning objectives, suggested delivery techniques and specific equipment and material requirements that you will have to coordinate. Each lesson contains explanatory information and copies of required overhead transparencies. Where slide presentations are used, details are provided on the concept behind each slide and the explanatory text.

You should also review the participant's workbook and become familiar with that material.

Workshop Introduction

Purpose

The main purpose of this workshop is to clarify the use, intent and requirements of the *Pruning Guidebook* and the associated regulations and legislation under the Forest Practices Code.

Specific Learning Objectives

Participants will:

- discuss pruning benefits
- be introduced to basic pruning methods
- discuss and describe key biological pruning principles aimed at maximizing the value return from pruning
- rank stands using the guidebook stand selection guidelines and discuss the rationale behind the guidelines
- investigate some potential conflicts in management objectives with pruning projects
- discuss the two pruning scenarios that require a pruning treatment in a silviculture prescription to meet free growing obligations
- become aware of requirements in an SMP that are critical to pruning prescriptions
- become aware of implementation issues regarding contracts
- discuss the key evaluation criteria for monitoring and compliance with pruning contracts
- become aware of the key reporting issues for pruning.

Target Audience

This workshop will be of interest to industry, government and consulting personnel responsible for preparing, implementing or monitoring prescriptions and contracts for pruning.

Format

The workshop is intended to be a half-day indoor session. It could be combined with the one-day juvenile spacing workshop, or with a half-day pruning field session if local demands require it.

A variety of instructional techniques are used to achieve the objectives of the workshop including:

1. lecturettes and videos,
2. case studies, and
3. group exercises (classroom and field).

Participant involvement throughout the workshop should be the focus. The role of the facilitator is to direct discussions and to clarify points. Maintaining tight control over time during the exercises and field trips is a major task.

Materials

Materials included with this guide for facilitators are:

- overheads
- the Pruning video
- the Pruning for Value demonstration box (#2 preferably)
- the participant's workbook
- references.

The workshop is designed for 20–24 participants per session. Trying to include more participants will make the group difficult to manage and will reduce the value of the learning experience for everyone.

Facilitators

This workshop was designed to be delivered by one facilitator. Facilitators should be intimately familiar with the subject matter.

Instructions

Read through all of the materials in the facilitator's guide carefully. You should also review the following references:

- *Pruning Guidebook*, July 1995 – Ministry of Forests
- *Pruning Second Growth Stands* – a video produced by the Ministry of Forests
- *Timber Quality and Pruning: An Analysis of Management Regimes for the Siuslaw National Forest* by Fight, Fahey and Johnston
- *Making Precommercial Operations Commercial* by David Leach
- *Early Pruning of Douglas-fir: Production rates and product implications* by Reutebuch and Hartsough
- *Tree Size, Pruning and Clear Lumber* by Roger Fight
- *Appendix E: Pruning and Excising* In *White Pine Blister Rust in Northern Idaho and Western Montana: Alternatives for Integrated Management* by Hagle, McDonald and Norby

Also recommended:

- *A Discussion of Wood Quality Attributes and their Practical Implications* by Jozsa and Middleton, Special Publication No. SP-34, Forintek Canada Corp. 1994.

Ensure that you are comfortable with the flow and the materials for all the exercises in the workshop. If you have any questions, ask the Ministry of Forests contact person.

Lesson 1

General Introductions

10 minutes

Objectives:

1. To provide an overview of the course and timetable for the day.
2. To solicit any questions regarding the workshop.
3. To allow the participants to feel comfortable with their surroundings and the issues of the day.

Equipment Needs:

- name tags
- overhead projector
- workbooks
- flip chart, pens, masking tape

Method:

lecturette

Learning Objectives

Participants will:

- understand the benefits of pruning
- become aware of basic pruning methods
- discuss and describe key biological principles, aimed at maximizing end product values for pruning
- rank stands for pruning using the *Pruning Guidebook* and discuss the rationale behind the guidelines
- investigate some potential management conflicts
- discuss SP and SMP requirements
- become aware of contractual issues
- discuss key evaluation criteria for monitoring contracts
- become aware of the key reporting issues

Overhead: **Workshop Outline**

Facilitator: The facilitator will go over the workshop outline and describe when activities will take place

Introduce yourself and your relationship to the workshop.

- Have the participants introduce themselves or their neighbor. Check them off the attendance list and have them make name tags.
- Go over the workbook and its contents.
- Record any concerns or questions on a flip chart page to ensure coverage in the session—post it on the wall.
- Review the structure and layout of the participants workbook.

Note: If you have a good self-effacing or pruning-related story, it may provide some levity to take the edge off the session.

Pruning Workshop Outline

Workshop Introduction	8:00 – 8:15 am
The Benefits and Methods of Pruning	8:15 – 9:15 am
Pruning Principles	9:15 – 10:15 am
Coffee	10:15 – 10:30 am
Ranking Stands for Treatment	10:30 – 11:00 am
Developing Pruning Prescriptions	11:00 – 11:40 am
Administering Pruning Contracts	11:40 – 12:10 pm
Adjourn	12:30 pm

Lesson 2

Introduction: The Benefits and Methods of Pruning

60 minutes

Objectives:

1. Participants will understand the benefits of pruning through discussions and review of some video footage.
2. Participants will be introduced to basic pruning methods.

Equipment Needs:

- flip chart
- Ministry of Forests video – *Pruning Second Growth Stands* (cued up at the start of Part One)
- VHS player and monitor
- overhead projector and screen

Method:

This section starts with a turn-to-your-neighbour exercise where the participants contemplate and list the benefits of pruning. A brief section of video confirms or expands on this discussion. The instructor debriefs the discussion to ensure clarification. Specific economic questions regarding increased quality are addressed, using a few overheads. Another brief section of video is presented and discussed to introduce basic pruning methods.

Note:

Flip Chart: **The Benefits of Pruning – Why do we Prune?**

Facilitator: Turn-to-your-neighbour exercise

1. Ask the group the question and give them 10 minutes to list some points.
2. Write all of the points on the flip chart (good or bad) without discussing any of the points.

Video: **Part One – Why do we Prune?**

Facilitator: Run the tape (4 minutes) – Cue at start (run to Part 2 – How to Prune)

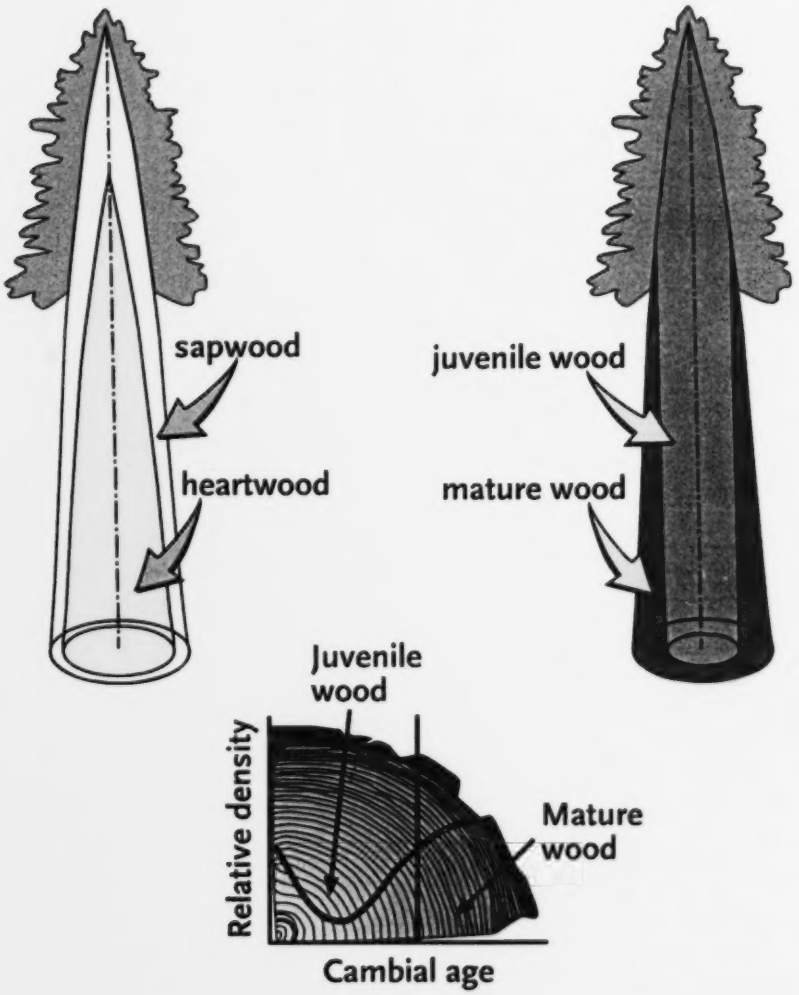
1. Re-visit the list of points on the flip chart.
2. Ask the group if there are any additional points they would like to add.

Key Points At this point make sure that all of the following key points are brought forward:

- Increased log and lumber value – but more specifically:
  - reduced knotty core and increased clear wood production
  - improved wood quality by reducing juvenile wood production
  - reduced stem taper (better lumber recovery over time). While being a benefit for quality, you must be careful of encouraging low taper in stands with a high windthrow or snow breakage hazard.
- Reduced impact of white pine blister rust (more on this later).
- Reduced fire hazard in open stands with a thick-barked, fire resistant species. This is particularly important in dry-belt fir stands.
- Improved access – generally pruned stands are easier for large mammals (humans and ungulates?) to walk through. Of course this depends on the site – often until crowns close again brush cover can be quite heavy on rich sites.
- Aesthetics – this will depend on the audience. Pruning (along with spacing) gives the forest a very "managed" appearance, which is good if this is desirable to your public. Where the public is more interested in wild, natural or old growth forests, pruning may not be beneficial for aesthetics.

3. Ask them if there are any questions about what they saw on the video.

Juvenile Wood vs Mature Wood



Note: They may have a few questions on the following

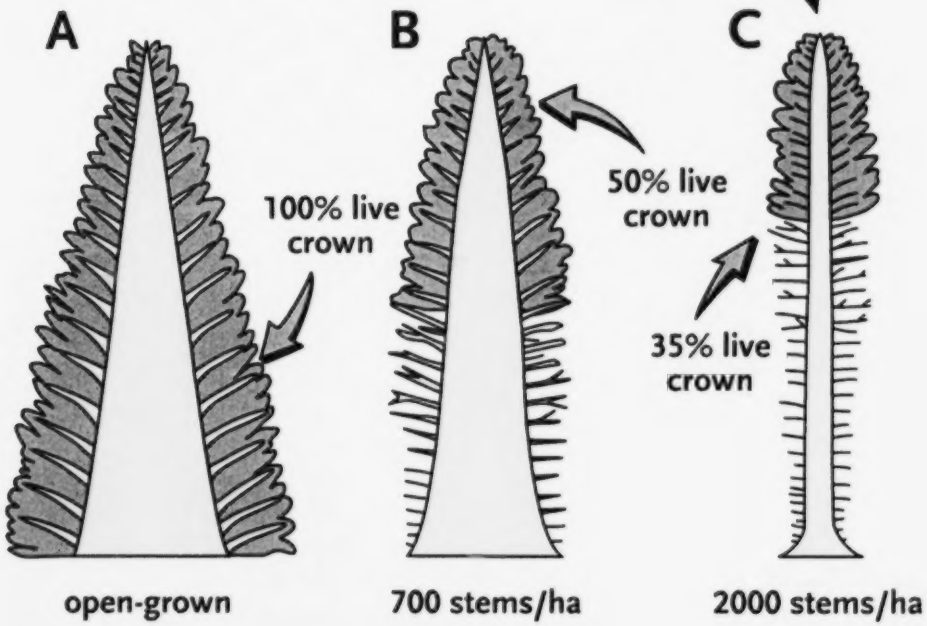
Optional
Overhead: **Juvenile Wood vs Mature Wood**

- A pronounced change in density often occurs during the first 15–30 years of growth on a tree. As wood density increases beyond this point it is often referred to as the juvenile wood mature wood transition.
- This "juvenile wood" is found in all trees, including old growth.
- Juvenile wood is produced in that portion of the stem directly under the influence of the live crown and the high levels of growth hormones (auxins) that are concentrated there. Juvenile wood is more appropriately called "crown formed" wood.
- Juvenile wood has lower relative density than mature wood. Relative density is the density of wood at a given moisture content relative to an equivalent volume of pure water. Juvenile wood has shorter fibres, larger fibril angles and slightly lower cellulose content than mature wood. These properties make juvenile wood more prone to warping and structural failure.
- As the live crown recedes up the stem, less auxins reach the lower stem and mature wood is then produced.
- Therefore, a 15-year-old Douglas-fir Christmas tree, with live branches to the ground would have 100% juvenile wood. If this tree grew for another 50 years in a 500–600 stem/ha stand on a medium–good site on the BC coast, its merchantable stem could contain about 50% juvenile wood by volume.

Live Crown and Stem Taper

Pruning controls the live crown

- **similar to high stand densities**

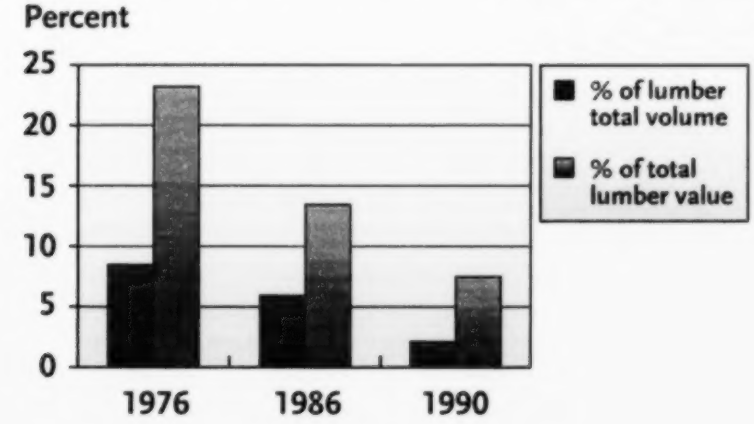


Optional Overhead: Impact of Pruning on Reduced Stem Taper

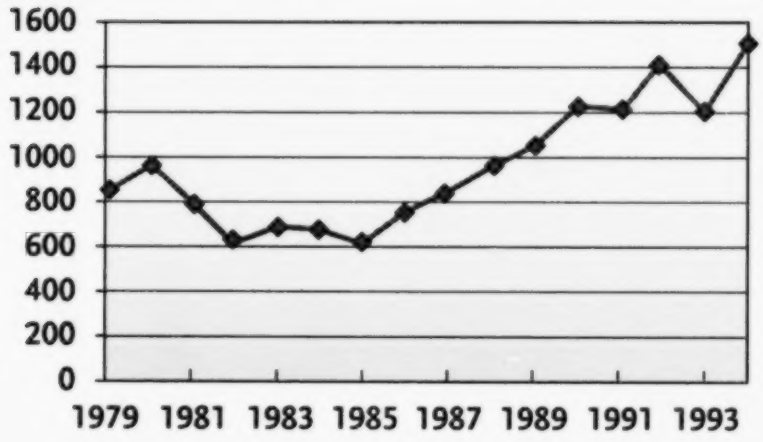
- Reduced auxin on the lower stem, as a result of being further from the live crown, also results in slower radial growth than the upper stem, which is closer to the live crown.
- This differential growth over time will reduce the taper of the tree making it more cylindrical in shape.

Trends in Clear Wood Values

Reduction in clear wood in the Pacific Northwest



Coast mill prices for Fdc lumber



Overhead: Trends in Clear Wood Production

- The value of aesthetically attractive lumber products is projected to rise as old growth timber supplies dwindle.
- Estimates of real price increase of 1–2%.
- Increasing scarcity of appearance grades will produce premium price differentials.
- The premiums for clear wood will likely be in the appearance grades as engineered wood products will likely heavily compete in structural grades.

Note: Engineered wood products such as trusses or parallam are still made from high valued wood (trusses are MSR 2 × 4s). Parallam comes from long strips of old growth Douglas-fir.

Changes in End Product Mix

A typical coastal Douglas-fir stand grown at 500 stems/ha

	Without pruning	With pruning
Clears	**0%**	**12%**
Select and #1	**56%**	**48%**
#2 lumber	**24%**	**20%**
#3 lumber	**12%**	**12%**
Economy	**8%**	**8%**

Overhead: Pruning Alters the End Product Mix

▲ The impact of pruning on timber production is not on volume, but value, based on the shift in end product mix to more clears.

Note: the production of clear wood may increase the value of a log at harvest by 4 to 10 times the value of an unpruned log.

Video: **How and When do we Prune?**

Facilitator: Run the video from the end of the "why should we prune section" to the start of the "where should we prune section."

Flip Chart:

1. Ask the group if they have some experiences that they would like to relate to add to the information presented. Write the points on the flip chart.
2. **With regard to pruning in the winter:**
   - In very cold temperatures (below about -20°C) shears may shatter branches and cause irregular cuts. You may be better off in such temperatures with pruning saws.

Lesson 3

Pruning Principles

60 minutes

Objectives:

1. Participants will discuss and describe key biological pruning principles aimed at maximizing the value return.

Equipment Needs:

- Ministry of Forests "Pruning for Value" case of pruning samples—Kit #2 (Note: this is the only kit that has numbered samples)
- flip chart
- Ministry of Forests video – *Pruning Second Growth Stands* (cued up at the start of Part One)
- VHS player and monitor
- overhead projector and screen

Method:

This lesson starts with a small group exercise where the participants examine several wood samples (cross-sections) to identify some key principles for pruning. Next, the instructor shows some overheads with a view of each sample in turn and asks the appropriate group to explain their discovery to the class. The instructor ensures all key principles emerge. A short lecturette follows that reinforces some of the principles raised by expanding on them to provide a greater depth of understanding.

Note: You should hide written clues on sample cross-sections with masking tape.

Wood Samples & *Flip Chart:* Pruning Principles

Facilitator: Small Group Exercise—Wood Samples (Reference: Pruning Principles, **page 6–11**, *Pruning Guidebook*)

1. Divide the group into 6 small groups.
2. Hand out wood samples as follows to the groups:

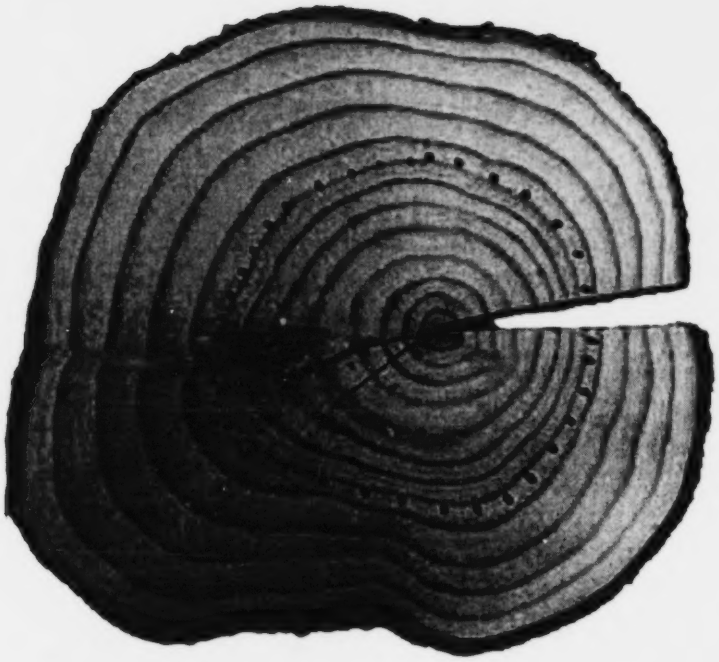
Samples 1&2 – Group 1	Samples 3&4 – Group 2
Samples 5&6 – Group 3	Samples 7&8 – Group 4
Sample 9 – Group 5	Sample 10 – Group 6

3. Ask the groups to study the samples and, based on what has already been discussed and what they see in the samples, **what key lessons do they see for pruning to maximize investments** (10–15 minutes).
4. Set the "Stillwater Main" large disk sample somewhere central in the room so that the participants can compare their samples to the Stillwater sample (where the sample asks them to do so).
5. Allow the participants to present their findings using overheads 3 • 1 to 3 • 12. You should put up the overhead in the sequence indicated below and ask the appropriate group to explain.
6. End by asking the group what additional principles emerged from reading the "Pruning Principles" section of the guidebook.

Key Points: Ensure the following emerge during the discussions (points that would generally come from the guidebook rather than the samples are in italics):

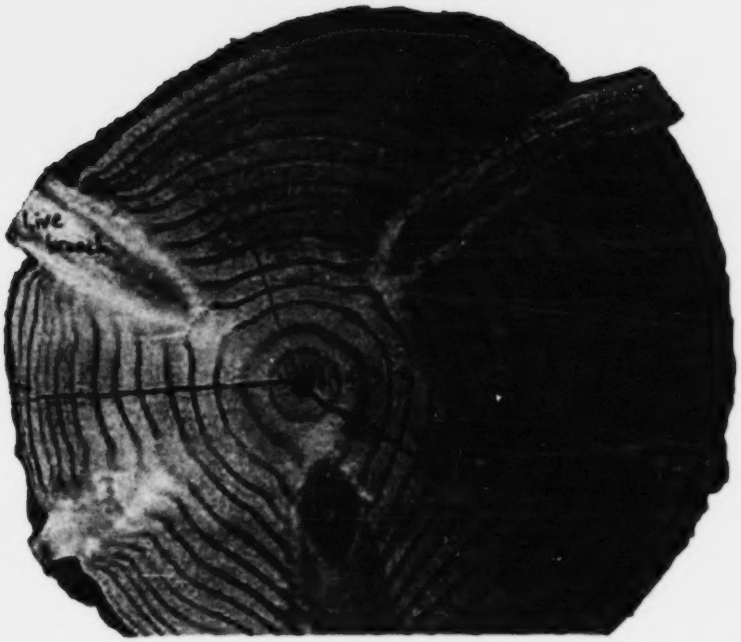
Pruning Principles
Wood Sample Exercises

Sample #1



Pruning Examples
Wood Sample Exercise

Sample #2



Sample 1 & 2

Sample 1 OH 3 • 1:	Prune early (less than 10 cm diameter), even less than 10 years old. Presumably the trees will be tall enough for the lifts planned (generally 5–7 m tall). Pruning early is the single most important thing to remember in pruning. Delaying a pruning treatment by just seven years can reduce the Net Present Value of the end product by a factor of 10!
Sample 2 OH 3 • 2:	Occlusion of a dead branch takes longer than a live branch. They should be able to see the occlusion on the live branch in sample #1, while sample #2 shows how occlusion may have to start deep within the stem of a tree with a dead branch. *Leaving branches until they die doesn't just mean you will have a larger knotty core and it will take longer for knots to occlude, but knots will be loose, a more severe quality problem.*

Pruning Principles
Wood Sample Exercises

Sample #3

Pruning Principles
Wood Sample Exercises

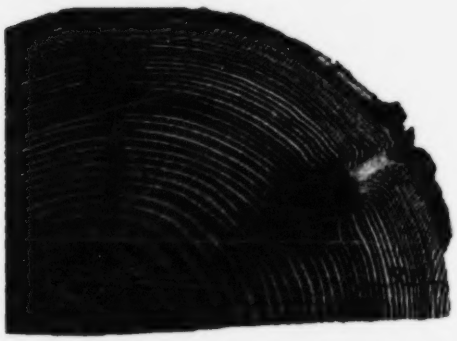
Sample #4

Sample 3 & 4

Sample 3: OH 3 • 3	Prune in a stand that has been spaced and is fairly open. Excessive stocking will slow occlusion and clear wood production, wasting the pruning investment. Prune on richer sites to optimize clear wood production over time (similar to the lower stocking). *Generally pruning is considered economically viable on a SI of 20 or better. A decrease in costs may make lower site indices more viable.*
Sample 4 OH 3 • 4	*They will also say to prune early since the sample #4 shows nice clear wood production even just at age 17, when pruned at age 9. The constrained knotty core is clearly evident here.*

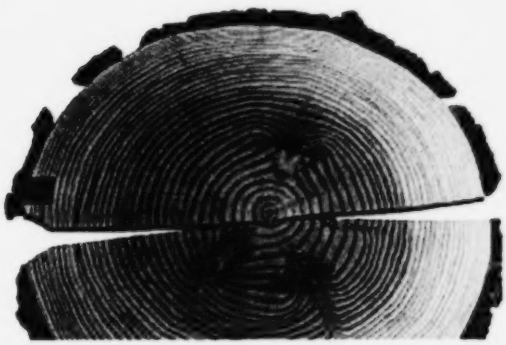
Pruning Principles
Wood Sample Exercises

Sample #10



Pruning Principles
Wood Sample Exercises

Sample # Stillwater Main



Pruning Principles
Wood Sample Exercises

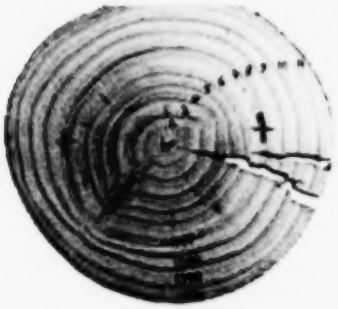
Sample # Stillwater Mainline, brush hook pruning

Sample 10 & 11

Sample 10 OH 3 • 5 Sample: Stillwater Main OH 3 • 6	Show a slide of sample 10 and a comparison slide of the Still water Main sample; check with groups 10 and 11 to see if they also found that pruning in a more open stand is optimal and that richer sites make for a better investment.
Sample: brush hook pruning OH 3 • 7	The Stillwater Mainline disc will also show a fairly messy occlusion because the pruning was fairly crude. Pruning with a brush hook resulted in cutting the branch collar, giving us about 4–5 cm of messy, distorted grain. Luckily the occlusion here was still relatively quick, owing to the high site index and/or wide spacing.

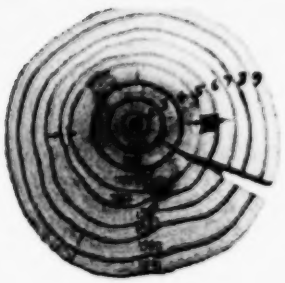
Pruning Principles
Wood Sample Exercises

Sample #5



Pruning Principles
Wood Sample Exercises

Sample #6

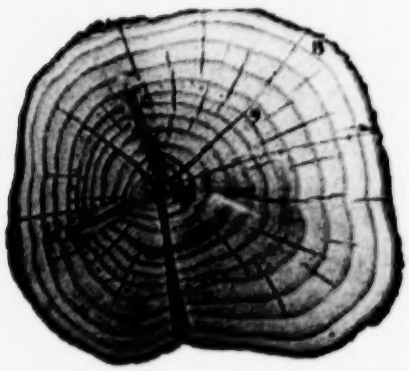


Sample 5 & 6

Sample 5 & 6 OH 3 • 8, 3 • 9	Do not prune up too high. Leave 50% of the live crown (unless you need to reduce this for other reasons white pine blister rust pruning). This point is illustrated by the pruning shock exhibited by this tree at breast height when pruned to 41% live crown. *Note: To obtain a constant pruning height throughout the stand, the shorter trees may be pruned to leave a minimum 30% live crown or three whorls remaining on the tree (whichever is greater). An alternative for biodiversity may be to not even prune the smaller trees, perhaps leaving up to 5% of the stand unpruned.* *Pruning in multiple lifts allows stands to be pruned earlier to produce a smaller knotty core. There is also less tendency to want to prune too high in any one lift.* *Multiple lifts tend to maximize the wood value and the production of mature wood. This would also suggest that you best be serious about pruning or question why you are doing it. Multi-lift pruning is a serious investment!*

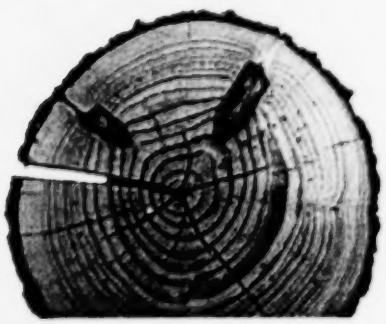
Pruning Principles
Wood Sample Exercises

Sample #7



Pruning Principles
Wood Sample Exercises

Sample #8

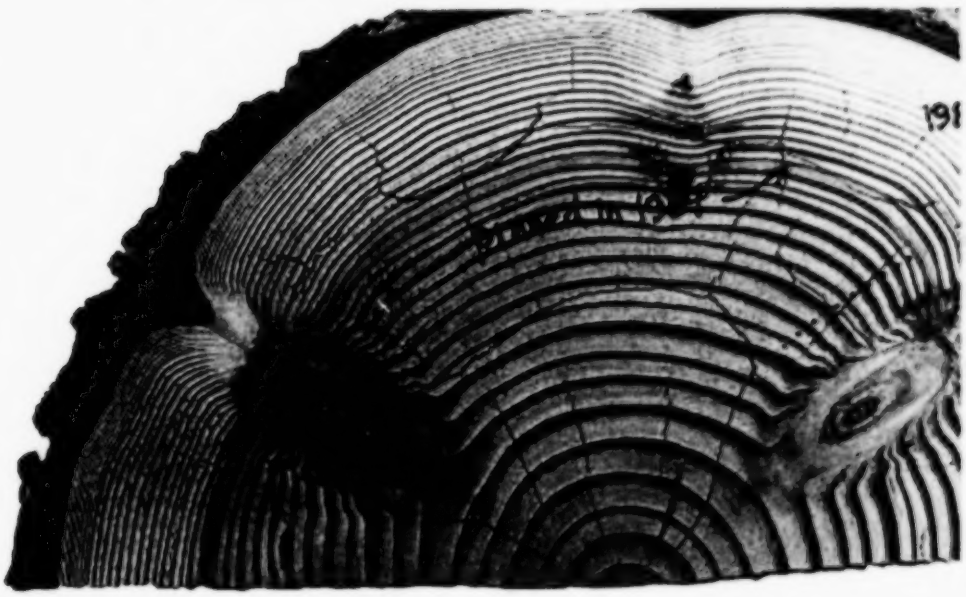


Sample 7 & 8

Sample 7 & 8 OH 3 • 10, 3 • 11	Again this group will notice that pruning should occur in open stands with lower densities, and on richer sites to maximize the investment by producing more clear wood in less time. ALSO, they should recognize that occlusion of branch stubs occurs more quickly when the growth increment is maximized (lower stocking/richer site).

Pruning Principles
Wood Sample Exercises

Sample #9



Sample 9

Sample 9 OH 3 • 12	Again the group will notice here the wasted investment when pruning in a dense stand (here it is 1400/ha). But also, pruning here was conducted late, giving a large knotty core. Notice that the occlusion of the branch stubs and resumption of normal growth rings was slow. This was due to the large branches on this old tree and the fact that older branches have considerable bark, which also slows occlusion and resumption of normal wood grain patterns.

Summary of Some Key Pruning Principles

- Prune early to minimize knotty core
- Prune your best sites (SI_{50}=20+)
- Prune your healthiest sites
- Prune in widely spaced stands
- Prune the best, space the rest
- Leave enough crown to respond with adequate growth
- Use proper tools
- Prune close to the tree, without damage to branch collar

Overhead: Summary of Some Key Pruning Principles

Facilitator: Summarize discussions

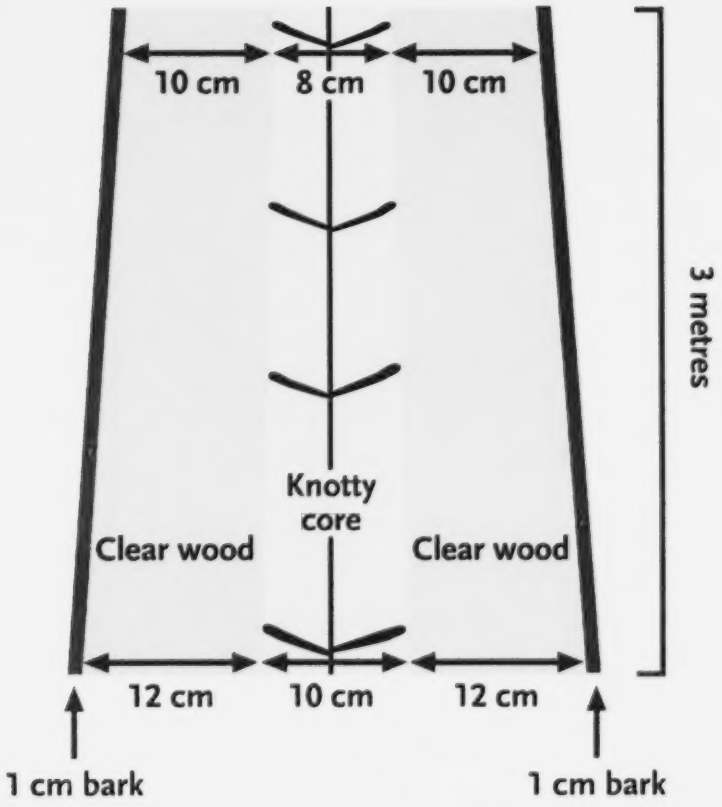
Mention that all of these points are in the *Pruning Guidebook* (pages 6–12).

Key Points

- **Prune early to minimize the knotty core** and maximize clear wood. This will be the most important factor to maximize return on investment. A difference of 7 cm diameter can increase return on investment by a factor of 10.
  - **Use overhead 3 • 2 and 3 • 4** to illustrate why this is the case
  - Branches on younger trees will be live, not dead, and bark will be thin, and therefore branch stubs will heal over much more quickly and will not form loose knots.
- **Prune your best sites.** Rapidly growing trees on SI_{50} sites of 20+ will give you the best return on investment (ROI).
- **Prune your healthiest sites.** To minimize the risk of losing your pruning investment, prune only those stands with minimal or no expression of forest pest agents.
- **Prune in widely spaced stands.** ROI is again limited, even on good sites, if the diameter growth of the pruned trees slows due to inter-tree competition. Ideal stand densities for pruning will usually be below that which is generally used to maximize volume production. Therefore, volume is sacrificed for value—this better fit with your objectives.
  - **Use overhead 3 • 7 and 3 • 8 to illustrate just how low** you may have to go to maintain open conditions for lodgepole pine.
- **Prune your best crop trees and space out the rest.** Pruned trees will be at a height growth disadvantage to neighboring unpruned trees. This will lead to overtopping and eventual death of pruned trees.
- **Leave enough crown to respond** (50% live crown is suggested). You need enough photosynthetic capacity to respond to treatment. On occasion this can be dropped as low as 30% live crown or three whorls remaining on the tree – whichever is the greater length – to maintain a fixed pruning height throughout the stand, while accommodating variation in tree height.
  - **Use overhead 3 • 8 and 3 • 9 to illustrate how to determine optimum height in stands with high variation. Prune young and prune high.**
- **Use proper tools and prune close to the tree, without damaging the branch collar.** This will allow for rapid occlusion of branch stubs and regular clear wood production over these stubs.

The End Product Target for Pruning

One Lift



Overhead: **The End Product Target for Pruning (one lift)**

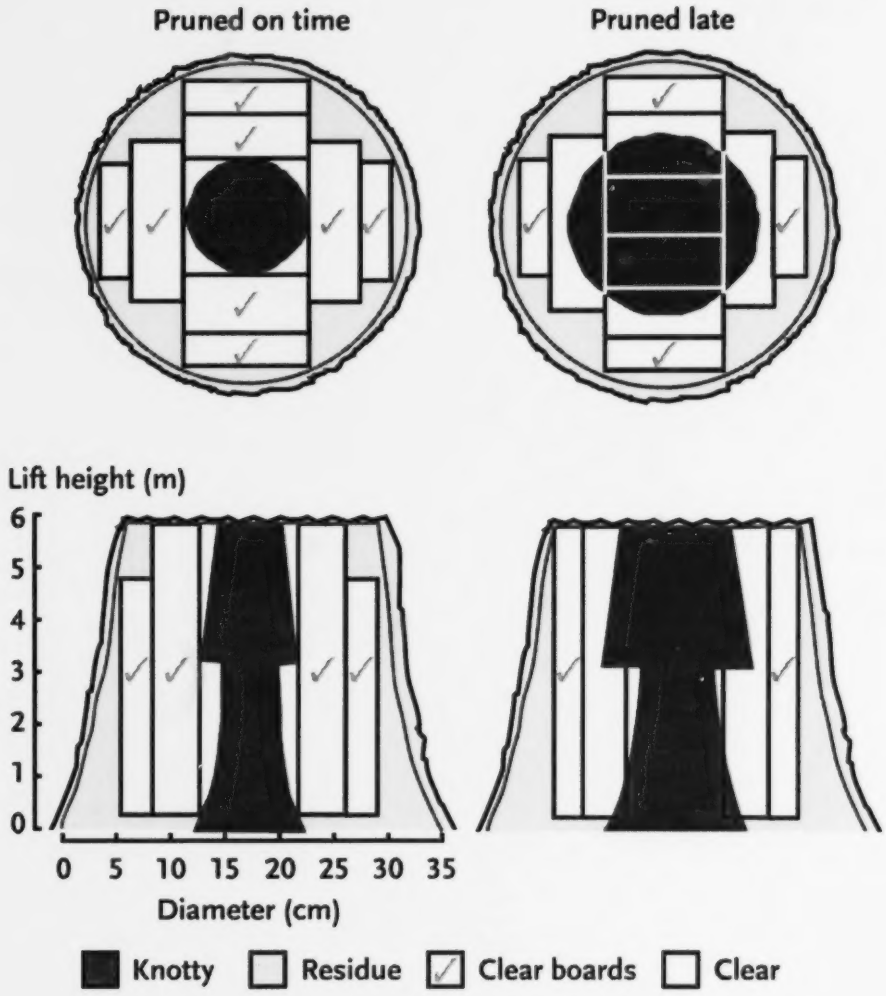
Facilitator: Summarize discussions by pointing out what we are aiming for

Key Points

- We will need to prune up to at least 3 m to give us one high value butt log.
- We must minimize the knotty core to maximize clear wood production. An 8–10 cm knotty core is the maximum size desirable.
- We need an end product with a large enough dbh to achieve a clear shell that is AT LEAST 10 cm wide at the top end and a minimum of 3 m long.
  - to produce 1 × 6, 1 × 8, 1 × 10 inch boards which command the best values
  - to produce high value veneers (e.g., clear lodgepole pine veneer)
- We must ensure that we time the treatment properly and conduct the pruning on our better sites.

Note: On the higher sites, the window of opportunity for best pruning becomes even more critical. Since trees grow more rapidly on highly productive sites, they grow through this "ideal" window of opportunity more rapidly than on poor sites.

Distribution of Clear Wood Relative to Timing of Treatment



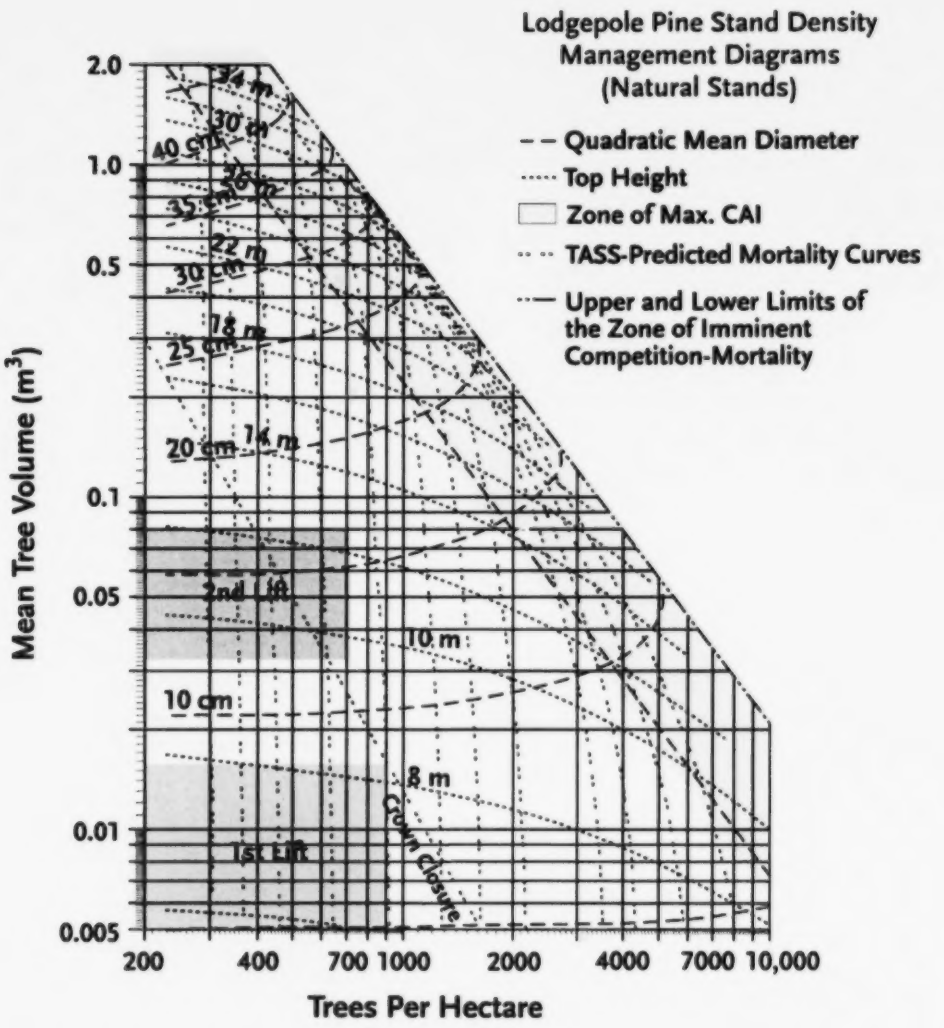
Overhead: Distribution of Clear Wood Relative to Timing of Treatment

Facilitator:

Key Points

- It becomes easy to see on this overhead why the ROI can be so much better when stems are pruned young, at a small diameter.
- The stem pruned on time has close to 4 times the volume of clear wood than the stem pruned late. At the same time, the branches on the stem pruned late may have been bigger and more expensive to cut. Where would you rather spend your money?

Optimum Pruning Density
To Minimize Inter-crown Competition



Overhead: Optimum Density for Pruning in Lodgepole Pine

Facilitator: Very quickly explain how this graph works

Key Points

- This is a stand density management diagram developed for lodgepole pine based on numerous TIPSY runs of pine TASS data. The diagram is based on the mortality curves formed through natural mortality of pine started at different densities.
- The relationships you see are independent of height, although they only hold true for single species, even-aged stands.
- The quadratic mean diameter is graphed in the dark dashed lines and the top height is the dark dotted lines.
- The crown closure zone is not exactly crown closure as we generally know it, but the time when the crowns are starting to interact such that they are affecting the growth of one another.
- The zone of imminent mortality is the zone where competition is so high that mortality is going to occur.
- The diagram shows first lift pruning at densities up to 900 sph and 5–7 m in height to minimize inter-crown competition (the crown closure line). The optimum range for lodgepole pine is generally between 700 sph and 900 sph to maintain decent site occupancy. At 10–12 m the 2nd lift should occur (if there is to be one). This will maximize clear wood production as the stem grows from 5–8 cm diameter up to 12–17 cm diameter.

Note: Using this diagram for lodgepole pine, we see that the TASS data suggests a stand at 1000 stems per ha would be getting competitive crown interactions at 8 m in height. Likely significant interactions would occur at 12–14 m in height with a noticeable decline in diameter growth. This has been documented on a real site in the Prince George District.

Timing
Determining Optimum Pruning Height

How do I time my lift in a stand with variable heights?

Consider:

- Height of pruning lift
- 50% residual crown is best

Example:

- 3 m single lift pruning
- average diameter trees should be:
  - 6–7 m tall (50% LC)
  - 5–10 cm dbh
- taller trees? should mostly be <12 cm dbh
- many smaller trees?
  - delay treatment until average diameter trees are closer to 7 m and 10 cm dbh
  - smaller trees can be 4.5 m

Overhead: **Determining Optimum Pruning Height in Stands with Variable Height**

Facilitator: Summarize discussions by pointing out what we are aiming for

Key Points

- Remember that timing is everything in pruning.
- First determine the height of the pruning lift.
  - One lift only—generally 3 m to allow for a decent butt log.
  - If 2 or 3 lifts, you can get away with a lower initial height.
  - In our example we want a one lift height of 3 m.
- To ensure 50% live crown, we need at least a 6 m height and probably somewhere between 6–7 m to be safe.
- You will then want the trees in your stand to have an average stand diameter between 5–10 cm.
- If you have many trees taller than 6 m, you should ensure that they are not more than 12–15 cm dbh.
- If you have many trees smaller than your average diameter or 5–10 cm and height less than 6 m, you should delay pruning until your stand is in the "ideal window of opportunity."

Lesson 4

Ranking Stands for Treatment: Choosing the Best Investment Opportunities

30 minutes

Objectives:

1. Participants will rank stands using the guidebook stand selection guidelines.
2. Participants will discuss the rationale behind the guidelines for stand selection.

Equipment Needs:

- flip chart
- Ministry of Forests video – *Pruning Second Growth Stands* (cued up at the start of Part One)
- VHS player and monitor
- overhead projector and screen
- Ministry of Forests *Pruning Guidebook*

Method:

This lesson starts with a review of the basic points for ranking stands for treatment presented in the video. The ranking criteria are compared with the principles already discussed. A case study exercise will have participants use and become familiar with the pruning ranking guidelines. Some further questions are raised by the instructor and they are discussed to ensure that the participants clearly understand the rationale for the various ranking criteria.

Video: ***Review of Stand Selection Guidelines***

Facilitator: Run the tape (5 minutes). Cue at end of Part 1 (How do we prune?). Run through the Stand Selection Criteria to the Contract Administration Section.

Flip Chart: Re-visit the summary of key pruning principles on the flip chart from the previous lesson.

1. Ask the group if there are any further questions
2. Get the group to turn to their neighbor and complete the Stand Ranking Exercise.
   - ▲ Get them not to use the *Pruning Guidebook*, but instead to use what they have learned thus far for an intuitive choice. Tell them to write this down and then go to the *Pruning Guidebook* "Appendix 1" (page 23) to use the ranking guidelines to get a final determination. (Allow 20 minutes.)
3. Point out that, if there is anything they don't understand, the *Pruning Guidebook* gives the rationale behind the guidelines on pages 6–11.
4. Did their intuition agree with the guidelines? How did they make their decisions – rationale? What did they learn or have reinforced by this exercise?

Key Points

- ▲ Most groups will choose stand #3 as the best investment.
- ▲ They should eliminate stand #1 based on its large diameter (mainly), lower SI, higher stand density and distance.
- ▲ They should not choose stand #2 because of the larger diameter, higher density and distance.

Note: Some may still like it due to the SI, but point out the density—the production of clear wood will drop off as crowns close.

Coastal Stand Ranking Exercise

Scenario: Which stand offers the best pruning investment opportunity?

You will have some money available in your silviculture budget over the next 5 years to do some pruning to help meet your management plan objective of achieving a range of end product values, including some high quality clear sawlogs in the next rotation. Three areas have been identified as potential pruning candidates. These are large stands. Any one of them should be able to absorb all of your pruning budget for the next five years.

Assume:

- all of the stands are 90% Douglas-fir, with minor amounts of hemlock and redcedar.
- no forest health damage is apparent in any of the stands.

Stand #1

SI_{50}:	22
height (m):	6.2
dbh (cm):	17
density (stems/ha):	900
distance from mill (km):	142
road condition:	minor repairs required

Stand #2

SI_{50}:	34
height (m):	7.1
dbh (cm):	14.3
density (stems/ha)	780
distance from mill:	89
road condition:	minor repairs required

Stand #3

SI_{50}:	30
height (m):	5.6
dbh (cm):	7.0
density (stems/ha)	520
distance from mill:	42
road condition:	good road

Interior Stand Ranking Exercise

Scenario: Which stand offers the best pruning investment opportunity?

You will have some incremental money available in your silviculture budget over the next 5 years to do some pruning to help meet your management plan objective of achieving a range of end product values, including some high quality clear sawlogs in the next rotation. Three areas have been identified as potential pruning candidates. These are large stands. Any one of them should be able to absorb all of your pruning budget for the next five years.

Assume:

- all of the stands are 90% lodgepole, with minor amounts of Douglas-fir and spruce.
- no forest health damage is apparent in any of the stands.

Stand #1

SI_{50}:	21
height (m):	7.5
dbh (cm):	14
density (stems/ha)	650
distance from mill:	142
road condition:	minor repairs required

Stand #2

SI_{50}:	26
height (m):	8.1
dbh (cm):	12.3
density (stems/ha)	1100
distance from mill:	89
road condition:	minor repairs required

Stand #3

SI_{50}:	23
height (m):	6.5
dbh (cm):	7.8
density (stems/ha)	900
distance from mill:	42
road condition:	good road

Flip Chart: Additional Quesitons

Turn to the Appendix #1 on page 23.

Species Quesions:

Coast:

- Why would true firs be ranked lower?

  Due to the potential epicormic branching from true firs and the associated loss of quality from pin-knots.

- Why is forest health such a big concern? Just 5% of an agent puts the stand into a rank 2 category.

  The good candidates for pruning are usually open stands (stands just below full site occupancy). Even small percentage losses to forest health agents is significant, and pruning is a very expensive treatment.

- Is there a difference between pests? What if you had 5–10% Phellinus in the stand?

  Phellinus is a big concern because of its potential for spread and again the very high investment required for pruning. Some other pests (needle blights or casts) may just slow down growth for a year or two.

  Blister rust on 5–10% of the white pine component in your mixed white pine and Douglas-fir plantation.

Interior:

- Why would Douglas-fir and larch be ranked lower than lodgepole pine?

  The main reason is there is enough pine on good sites that we could exhaust our pruning dollars without going to other species. Also, there is a potential for epicormic branching, and the associated loss of quality from pin-knots, from fir although it is more of a problem with larch.

- Why would hemlock be ranked even lower?

  Again, lodgepole pine will meet the dollars available in the pruning budget for years to come. Also, you will want to prune the highest value species first.

  Or, gall rust can easily be dealt with by pruning since the infected branches are just cut off. If the stand was recently spaced, there shouldn't be many trees with fatal galls (<10 cm from the main stem).

Lesson 5

Developing Pruning Prescriptions

40 minutes

Objectives:

1. Participants will investigate some potential conflicts in management objectives with pruning projects.
2. Participants will discuss the two pruning scenarios that require a pruning treatment in a silviculture prescription to meet free growing obligations.
3. Participants will become aware of requirements in an SMP that are critical to pruning prescriptions.

Equipment Needs:

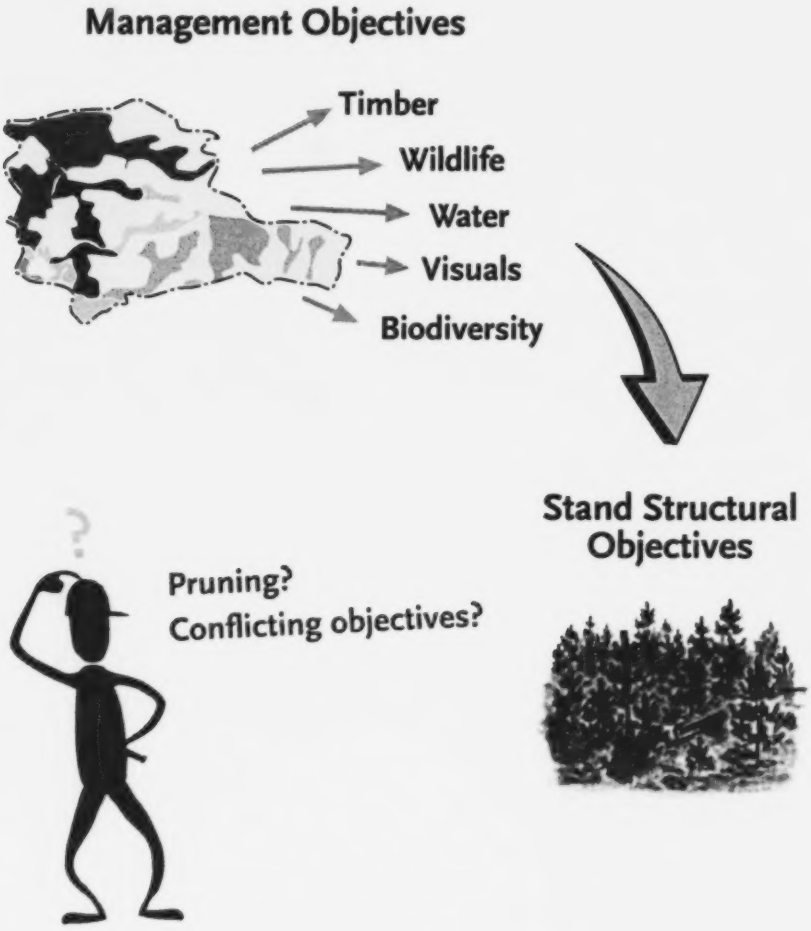
- overhead projector
- flip chart
- *Pruning Guidebook*

Method:

The instructor reviews several overheads and uses lecturettes and questioning to bring forward relevant points.

Note:

Management Objectives and Pruning



Overhead: Management Objectives and Pruning

Facilitator:

- Pruning helps to build the desired structure for the stand. It must fit with all management objectives for the stand.
- Ask the participants if there could be some potential conflicts between pruning and your various management objectives, and to provide some local examples. Debrief some approaches to avoid conflicts.

Key Points

Potential conflicts? (Most are related to wildlife habitat.)

- **Ungulate security cover** is reduced or virtually eliminated. This can be avoided by:
  - leaving visual buffers along main and secondary access roads. These can be spaced or unspaced buffers.
  - Consult with MoE staff: you may be able to work out other solutions like managing access through the access management plan.
  - leave some unpruned trees in the stand. You may choose unsuitable stems (smaller stems, deciduous, or poor quality wolf trees).

    Note: It may be better to leave these as small unpruned clumps. Partial-pruning with unpruned trees throughout the stand may create a situation where the pruned stems lose height dominance since growth is reduced for 1–2 years. Also, at time of harvest, it may be impossible to sort the pruned from the unpruned logs.

- **Reduced arboreal lichen production for woodland caribou and mule deer.** If areas have been identified as important mule deer or caribou winter range, consult the forest ecosystem specialist before pruning.
- **Restricted harvesting in Riparian Management Areas** may reduce the economic feasibility of pruning if you are unsure of recouping your investment in the future.
- **Aesthetics – may look too artificial and managed** (although this is a benefit with some viewers). You can avoid this in much the same way as you can avoid conflicts with security cover.

SMPs and SPs

Pruning

Mostly an incremental treatment

- ▲ SMP required

Sometimes a free growing obligation

- ▲ SP required
- ▲ two scenarios
  1. Pw is a crop tree
  2. low densities for habitat

Overhead: **SMPs and SPs**

Facilitator: Review the key points in the overhead

Key Points

Pruning as an incremental opportunity:

- Pruning is generally considered an incremental activity.
- Prescriptions for pruning will generally be included in an SMP, usually when it is written for the initial juvenile spacing treatment.

Pruning as a free growing obligation:

- There are, however, two occasions when pruning is a free growing obligation (*Operational Planning Regulation*).

1. Pruning western white pine to control blister rust. (District manager's discretion on pruning Idaho rust-resistent white pine.)
2. Pruning stands established for wildlife habitat with very low densities.

Note: Proposed changes in legislation to give the district manager discretion on pruning trees on lower productivity sites to meet free growing obligations where the volume and value of the timber is marginal (e.g., dry, low productivity sites that will not grow any appreciable large clear wood in a reasonable time frame).

Pruning White Pine Crop Trees

Normally Pw retained but not counted as a crop tree

> **Where Pw are to be managed as a crop tree, and if control of white pine blister rust is necessary, the Pw must be pruned to meet free growing requirements.**
>
> ***– Operational Planning Reg. 51(2)(d)(i)***

Rationale:

- **to directly remove threatening branch infections**
- **to reduce potential infection sites**
- **increasing clear wood – secondary objective**

Note: **Proposed change in legislation to give the district manager discretion on pruning rust-tolerant white pine seedlings grown from Idaho seed stock to meet free growing requirements.**

Overhead: Pruning to Control White Pine Blister Rust

Facilitator: Review the key points in the overhead

Key Points

- Throughout its range, western white pine often occurs as a minor component in many southern BC stands.
- Generally these trees are left during spacing treatments to maintain the white pine gene pool, hopefully helping the tree develop more resistance to the rust.
- Usually these white pine are not counted as crop trees and are often referred to as ghost trees.
- **However, where white pine are left as crop trees and counted as a component of the stand and white pine blister rust is a concern, they normally must be pruned to meet free growing requirements.**
  - to directly remove threatening branch infections
  - to reduce potential infection sites.

Note: The rust enters through the needles. It is felt that most infections start in the lower crown where conditions seem to be right for inoculation.

  - to increase the amount of clear wood on the bole. A secondary objective. If this becomes a main objective, usually a second lift will be planned as an incremental activity.
- Where blister rust resistant white pine seedlings are planted, pruning will likely not be required, although this will depend on the degree of resistance bred into the seedlings.
- An SP must include pruning of white pine to consider it as a potential free growing crop tree.
- Lift #1 – done when the trees are 2.5–4 m tall to a lift height of 1.3 m (dbh)
- Lift #2 – completed when trees are greater than 5 m tall to a minimum of 2.5 m in height, leaving 50% live crown.

Pruning Very Open Stands Created for Habitat

Pruning required where minimum stocking is reduced to 30% lower than the guideline.

– Operational Planning Reg. 51(2)(d)(ii)

Rationale:

- **to address clumped stocking in coastal grizzly habitat**
- **volume is already compromised**
- **do not want to compromise value (high % juvenile wood and knots)**

Note: **Proposed change in legislation to give the district manager discretion on pruning trees on lower productivity sites to meet free growing obligations where the volume and value of the timber is marginal (e.g., dry, low productivity sites that will not grow any appreciable large clear wood in a reasonable time frame).**

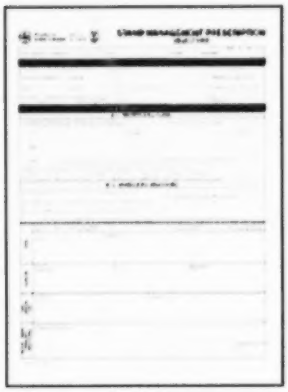
Overhead: Pruning Very Open Stands Established for Habitat

Facilitator: Review the key points in the overhead

Key Points

- Pruning will be required where stocking is reduced to 30% or greater BELOW the minimum suggested in the guidebook to meet wildlife habitat objectives:
  - The SP will describe the treatment and the pruning will become part of the free growing criteria.
  - As with other basic obligations, licensees will have to pay for this treatment.
- This regulation was created to address the very open stands created for grizzly bear habitat on the coast and may also apply to very open habitat for deer and elk.
- It was felt that without pruning, these stands will produce open-grown, extremely low-value wood. Since these sites already are producing volume far below the site potential, the serious loss of value on the remaining stems is a concern.
- This requirement may not apply to dry belt fir sites below SI_{50} of 15 m since the returns on such an investment will be very low—the Ministry is currently working on an interpretation of this requirement.
- While pruning is an expensive treatment, fewer stems will be pruned in such open stands.
  - Where the MSS is normally 700/ha, the stocking would have to be 490/ha or less for this requirement to kick in.
  - Where MSS is 500/ha (as in dry belt fir stands) the stocking would have to be 350/ha or less for the requirement to take effect.
  - The lower cost associated with fewer stems may be somewhat negated on the coast in grizzly range since the brush (grizzly forage) in these open stands may be a serious impediment for pruners.
- At this point it may be wise to discuss any concerns or experiences that people have had regarding this regulation, since it will likely be a contentious topic.

Pruning Prescriptions and SMPs



B-2 – Stand Level Objectives

e.g., 1000 m^3/ha of 50 cm sawlogs at 90 years

D – Target Conditions & Strategy

e.g., The stand is to be spaced to 700 sph, followed immediately by pruning to 3 m. A second lift to 5.5 m will follow in about 8 years.

D-1 – Post-treatment Standards

E – Treatment Specifics

e.g., Shears or hand saws only – no chain saws will be allowed.

Overhead: Pruning Prescriptions and SMPs

Facilitator: Review the key points in the overhead

1. Have several transparencies of a blank SMP just in case there are other questions regarding the SMP format, etc. You should be familiar with the format (refer to the *Stand Management Prescription Guidebook*). Remember, this is not an SMP training session, so there is little time to discuss the intricacies of the SMP form.
2. Point out that these are the key sections pertaining to a pruning treatment in the SMP.

Key Points At this point make sure that all of the following key points are brought forward:

Section B-2 – Stand Level Objectives

- In section B-2, the management objectives should include the specific end product objectives for the pruned stems. In this example, WINTYPSY was used to get a rough estimate of volume and end product piece size.
  - This objective is for a coastal Douglas-fir stand of SI of 35 and a density of 500/ha. The OAF#1 was set at 10% and OAF #2 at 0.
- You may have some other objectives for pruning too—wildlife, forest health, fire protection (reduce ladder fuels in dry belt IDF stands), etc. All of these should be entered in the appropriate sections of this form.

Section D – Target Conditions and Strategy

- Tells the story of the stand. Should describe the pruning treatment and other stand tending treatments in general terms and show how they fit together.

Section D-1 – Post-treatment Standards

- Shows timing of treatments with measurable parameters listed. The key issues here for pruning are:
  - timing relative to other treatments
  - timing relative to diameter size and height
  - species and stems per hectare to prune
  - minimum lift height by lift (% live crown retention)
  - number of lifts

- May consider including a maximum diameter as well as the target. So that if the stand goes beyond the maximum, the pruning treatment would be canceled (remember access to funding may be constrained).

Section E – Treatment Specifics

- Shows any specific recommendations that may be incorporated into the Schedule C as clauses in the contract. An alternative would be to write up the clauses in a blank schedule C and staple to the SMP for future reference.

Pruning Prescriptions and SMPs

The Window of Opportunity Concept

Consider including a
Pruning Window of Opportunity
in Section D-1 (Post-treatment standards).

- **Use an upper limit for diameter beyond which no pruning will occur (e.g., 15 cm).**
- **In case funding does not come through in a timely fashion.**

Overhead: **Pruning Prescriptions and SMPs: Window of Opportunity Concept**

Facilitator: Review the key points in the overhead

Key Points At this point make sure that all of the following key points are brought forward:

- In Section D-1 you can add a maximum diameter limit so that the treatment is dropped if funding does not come through in time.
- This is different than anything that you may include in an SP, because we are dealing with incremental activities that are usually going to be dependent on obtaining an outside funding source.

Lesson 6

Administering Pruning Contracts

30 minutes

Objectives:

1. The participants become aware of implementation issues regarding contracts for spacing and pruning combinations and pruning for multiple lifts.
2. The participants discuss the key evaluation criteria for monitoring and compliance with the contract.
3. The participants become aware of the key issues regarding reporting of pruning projects.

Equipment Needs:

- Ministry of Forests *Pruning* video
- VCR and monitor
- overhead projector and screen
- flip chart

Method:

The participants view the contract administration and equipment sections of the MoF *Pruning* video. The lessons from the video are debriefed by the instructor through a questioning exercise. If there is time, the instructor will review the key sections of the Ministry of Forests Pruning Contract.

Note:

Contract Administration and Project Administration

- How do you determine the timing of the various lifts?
- Suggest some approaches to space and prune combination projects.
- List the evaluation criteria for contract monitoring.
- What is the key issue for reporting?

Video: **Contract Administration and Project Management**

Facilitator: Run the video from the beginning of "Contract Administration" to the beginning of "Wood Quality."

Overhead: Debrief the video by asking these questions

Debrief each point on the flip chart.

#1: How do you determine the timing of the various lifts?

Key Points

- Time subsequent lifts when the diameter immediately below the first lower whorl of branches equals the diameter at the bottom of the previous lift, just prior to being pruned.
- Generally first lift pruning is done at 5–7 m in height; second lift pruning at 9–10 m in height; and third lift pruning at 12–13 m in height.

#2: Suggested approaches to space/prune combination projects?

Key Points

- Space during the morning and prune in the afternoon during the fire season.
- Since pruning is quiet work, the crew can monitor the radio and, in essence, be a back-up fire crew.

#3: List the evaluation criteria for contract monitoring.

Key Points

- **No ripping and scarring.**

  Note: There should be no scars greater than the scar created by the largest pruned branch.

- **Angle of cut.** The cut should be flush with the branch collar with a 0.5 cm stub or less (measured from the branch collar).
- **Correct pruning height with no attached small branches.**
  - All branches should be removed up to the proper lift height with a minimum of 3 whorls remaining or 30% live crown, whichever is greater.
  - No more than two small (< 3 cm long) branches allowed below the pruning lift height.

Note: **Minimum acceptable quality = 75% of the trees.**

#4: What is the key issue for reporting?

Key Points

- Make sure the stand is tracked so it is harvested to maximize the return on the investment. If it is forgotten about, it may be logged with the logs going to a mill that may not be set up to maximize the clear wood from the logs.

Optional Exercise: Review a sample contract

1. Highlight each clause that is specific to the pruning operation and discuss possible implications. Likely you will not have time in a half-day session for this.